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Otto Struve recommends us to separate our observations, so that it might be possible to ascertain our separate personal errors. We have, however, ascertained its amount from a considerable number of observations, viz. W = S + 0″·1, and this agrees very nearly with the amount ascertained by himself from the few separate observations published, viz. W = S + 0″·15. But, from a comparison of our own measures with those of others, we concluded that our errors were of opposite signs, and that the mean of our measures would not show any appreciable systematic error. This appears from Otto Struve's investigation to be the case. And on this ground we shall probably continue to give joint results, as being more trustworthy and more immediately available to the orbit computer.

We may add, moreover, that it is our opinion that a personal error in measures of this kind is very different in nature from those made in time observations; that it is masked in individual cases by accidental errors of far larger magnitude; and that it would be quite unsafe to apply it as a constant correction. Our present opinion is that a series of most careful measures of distance made by us on an easy star on a single fine night cannot be relied on to 0″·1, and that the only way of getting greater accuracy is to multiply the nights of observation.

Otto Struve also expresses the wish that our distances should be given to hundredths of a second, and they are so given in the Second Catalogue. We are very grateful to him for his encouraging criticism, and his appreciation of our circumstances—"das Instrument in Rugby in grossem Maasse zur Befriedigung wissenschaftlicher Neugier dienen muss, und überdies die Beobachter durch ihre amtlichen Pflichten an der bekannten Lehranstalt vielfach in Anspruch genommen sind."

Rugby, Nov. 7, 1877.

On the Atmospheric Lines between the two D Lines.

By H. C. Russell, Esq., Director of the Sydney Observatory.

I have a powerful spectroscope made by Hilger, of London, of which the greatest dispersion is equal to eighteen 64° prisms, and the definition so fine that I can measure one three-hundredth part of the space between the D lines. With this I have frequently examined the lines between the D lines, and find only seven; while it is stated that at Potsdam nine are seen; and many years since (1868) Dr. Huggins saw twelve at Kew, and in 1875 Colonel Campbell recorded nineteen in London. These facts led me to make a careful examination and measures of all the lines I could see here. Perhaps the information may be interesting to the members of the Royal Astronomical Society.

The diagram has been prepared by enlarging the drawings kindly given to me by Dr. Huggins and Colonel Campbell, and a careful plot from my own measures. I may state that, in order

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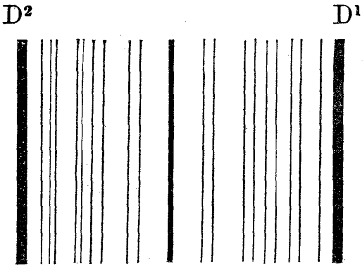
to identify the lines, I have numbered them 1 to 7, beginning at D1, and their positions, as determined by a number of readings with the micrometer, are as follows:—

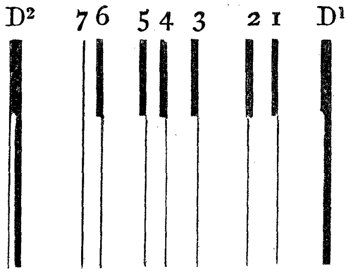
D1	1	2	3	4	5	6	7	D2	D3
000	41	67	124	151	173	213	232	291	299

4 is the nickel line always seen; 7 is the position, or very near it, of the zinc line; 1, 2, 3, 5, and 6 are evidently atmospheric lines, as they always increased in distinctness very fast as the Sun neared the horizon; 4 also seems to enlarge as if there were an atmospheric line coincident with it, and 6 increased faster than any other; when the Sun was near the horizon it was as thick again as D1; 7 did not increase at all, and almost disappeared when the Sun was near setting.

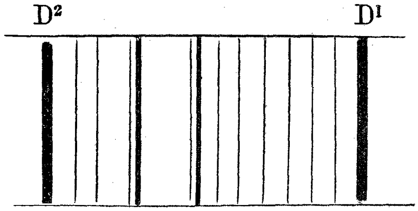
Lines between the "D Lines."



Colonel Campbell, 1875, London; with spectroscope by Hilger (eight glass prisms); "enlarged."



Sydney Observatory, 1877; spectroscope by Hilger (glass prisms). As thickened at the top, the lines show the appearance at sunset.



Dr. Huggins, 1863, with Mr. Gassiott's spectroscope at Kew, since presented to Oxford (bisulphide of carbon prisms); enlarged.

I have no drawing of the lines seen at Berlin.

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The line D3 has not, I think, been described before. It is a difficult line to see, and only to be made out with high powers. I have not reduced my measure to wave lengths, because the results obtained by Dr. Huggins and Colonel Campbell are only recorded in drawings, without measures. I have had prepared enlarged drawings of those obtained at Kew and London, with a careful plot from my own measures, which I enclose.

There are not many of the lines which agree; but as Dr. Huggins used bisulphide of carbon prisms, and Colonel Campbell only eight prisms, some of the differences might disappear if all could be reduced to wave lengths. On closely comparing the drawings, it will be seen that five lines were recorded in London between my No. 7 and D2, two others between D1 and No. 1, and three between Nos. 2 and 3. These spaces appear in Sydney, even under the most favourable conditions, entirely free from lines, or any sign of them. It would appear, therefore, that there must be some gases in the atmosphere of Europe, and especially of London, which are not present in Australia, or at least at Sydney.

Sydney Observatory,
July 26, 1877.

On the Spectrum of a Solar Spot observed at the Royal Observatory, Greenwich.

(*Communicated by the Astronomer Royal.*)

A fine spot has recently passed across the Sun's disk, showing a spectrum remarkable for the number of lines which are more or less affected by increased absorption, as will be seen from the following table:—

Element.	Number of lines observed.	Character of Change.
Calcium	12	Very much darker, and about doubled in breadth.
Sodium	2	Very much darker. The two D lines almost meet over the nucleus.
Titanium	11	Very much darker, and about doubled in breadth.
Iron	30	Slightly broader, by about a tenth, and decidedly darker, about half as dark again.
Barium	4	About twice as dark and twice as broad.
Magnesium	4	Much broader and darker.
Nickel	6	Half as broad again. Slightly darker.
Chromium	3	Somewhat darker, and broader by about one-tenth.
Hydrogen	3	Much fainter and less distinct. F line reversed in the neighbourhood of the spot, due north of the centre, on Nov. 5.
Coronal line	1	Much fainter over the spot.
D_3	1	Not seen either bright or dark, in spot or bridge.
Telluric bands	1	Band α. Broader and darker.